LISTING OF THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Original) A method for manufacturing a light guiding panel comprising:

transferring a transparent substrate that is a raw material for the light guiding panel, so that the substrate passes below an outlet of an injection nozzle at a predetermined speed;

making a predetermined amount of minute particles contained in a container free-fall in a unit time; and

forming a desired distribution of recesses formed on a surface of the transparent substrate, by mixing the free-falling minute particles with a high speed compressed fluid flow, and injecting the mixed particles on the surface of the transparent substrate being transferred.

2. (Original) The light guiding panel manufacturing method of claim 1, wherein the minute particles are injected through an injection pipe in which the thickness of the internal shape of the injection pipe decreases and the width of the internal shape increases in the direction from the entrance to the outlet of the injection pipe.

3. (Original) The light guiding panel manufacturing method of claim 2, wherein the injected minute particle group forms a belt shape having a long width and a thickness which is relatively less than the width and the changing trend in the width direction of distribution density of recesses to be formed on the transparent substrate corresponds to the changing trend of a unit area in the width direction of the belt.

4. (Original) The light guiding panel manufacturing method of claim 1, wherein the minute particles are diffusively injected through an injection nozzle, forming roughly a circle or an oval shape, and the injection nozzle is arranged so that the direction of the outlet of the injection nozzle is roughly perpendicular to the transfer direction of the transparent substrate and slanted to the surface of the transparent substrate at a predetermined angle, and a principle for

forming recesses by diffusion of injected minute particles is used such that the density of recesses decreases as the distance between a location on the surface of the transparent substrate and the outlet of the injection nozzle increases.

5. (Original) The light guiding panel manufacturing method of claim 1, wherein a plurality of the injection nozzles are arranged in a row in the direction across the transfer direction such that groups of minute particles injected from neighboring injection nozzles are connected in a row in the width direction of the transparent substrate.

6. (Original) The light guiding panel manufacturing method of claim 5, wherein in order to achieve smooth changes of recess distribution density, during an injection process the plurality of injection nozzles are made to swing in the direction across the transfer direction of the transparent substrate

7. (Original) The light guiding panel manufacturing method of claim 5, wherein the interval between injection nozzles and/or the injection amount of each injection nozzle are determined based on the distribution of recesses to be formed on the transparent substrate.

8. (Original) The light guiding panel manufacturing method of claim 1, further comprising: collecting minute particles collided with the transparent substrate and feeding the minute particles back to the container.

9. (Original) The light guiding panel manufacturing method of claim 1, further comprising: varying the transfer speed of the transparent substrate with respect to distribution of the recesses in the transfer direction of the transparent substrate.

10. (Original) The light guiding panel manufacturing method of claim 1, wherein a vent hole is formed on a position of a predetermined height on a falling pipeline connected between a bottom aperture of the container and the injection nozzle, and by the inflow of external fluid through the vent hole, a low pressure atmosphere generated by the high speed fluid flow

discharged through the injection nozzle is not propagated to a part above the vent hole, and by doing so, free-falling of the minute particles is guaranteed.

11. (Original) The light guiding panel manufacturing method of claim 1, wherein the minute particles are injected through a process in which the minute particles contained in the container are made to free-fall in the air, the free-falling minute particles are inhaled into a ventilating apparatus which generates a high speed air flow, and the high speed air flow and minute particles are evenly mixed.

12. (Original) The light guiding panel manufacturing method of claim 1, wherein the distribution density of the recesses formed on the surface of the transparent substrate increases as a distance from a location of optical source lamp installation increases.

13. (Original) The light guiding panel manufacturing method of claim 1, wherein the minute particles are any one or a combination of two or more selected in a group consisting of aluminum carbide, silicon carbide, zirconia, or diamond particles.

14. (Original) A particle injection apparatus for manufacturing a light guiding panel, comprising:

a container which stores minute particles and discharges a predetermined amount of minute particles in a unit time through a bottom outlet in a free-falling method;

a connection member which is connected to a bottom outlet of the container and provides a falling path of the minute particles;

a pressure fluid supply unit which supplies high speed compressed fluid through a pipe member; and

an injection nozzle unit which is connected to the connection member such that the minute particles fall into an internal cavity, and after the compressed fluid from the pipe member of the pressure fluid supply unit, the pipe member which is extended to the vicinity of the outlet of the cavity, are mixed with minute particles, injects the mixed fluid and particles to the outside through an outlet which is connected to the cavity,

wherein a vent hole through which fluid flows in the falling path is formed on a position of a predetermined height of the connection member and a low pressure atmosphere in the cavity and the connection member generated by high speed injection is complemented by fluid flowing in through the vent hole such that the minute particles are made to free-fall in an interval higher than the vent hole.

15. (Original) The particle injection apparatus of claim 14, further comprising:

an opening and shutting control unit which controls whether or not to discharge the minute particles from the container.

16. (Original) A particle injection apparatus for manufacturing a light guiding panel, comprising:

a container which stores minute particles and discharges a predetermined amount of minute particles in a unit time through a bottom outlet in a free-falling method;

a mixing transfer unit which mixes free-falling minute particles with high speed air and forcibly transfers the mixed particles; and

an injection pipe which is a pipe having an entrance and an outlet that are all open, whose entrance is connected to the outlet of the mixing transfer unit, and whose internal section shape shows that the thickness decreases and the width increases in the direction to the outlet,

wherein the mixed air and minute particles flowing in through the transfer pipe are injected through the outlet of the injection pipe.

17. (Original) The particle injection apparatus of claim 16, further comprising: an opening and shutting control unit which controls whether or not to discharge the minute particles from the container.

18. (Original) The particle injection apparatus of claim 16, further comprising: a thickness adjusting unit which varies the thickness of a section of minute particle group injected through the outlet of the injection pipe, in the width direction.

19. (Original) The particle injection apparatus of claim 18, wherein the thickness adjusting unit comprises: a fixing bar which is installed at an outer wall of the outlet end of the injection pipe; andat least one servo motor which is mounted on the fixing bar and is connected to an outer surface of a predetermined position of the outlet of the injection pipe so that the servo motor can pull the outer surface of the predetermined position.

20. (Original) The particle injection apparatus of claim 18, wherein the thickness adjusting unit is a pipeline adjusting member which is installed inside the injection pipe and blocks part of a path of the injection pipe such that the sectional shape of the minute particle group is changed.

21. (Original) The particle injection apparatus of claim 16, wherein the mixing transfer unit is formed by connecting one or a plurality of blowers, each blower having a rotor arranged in the internal space which has an open entrance and an open outlet and has a roughly cubic shape, and a motor which is installed outside the cube and rotates the rotor at a high speed.

22. (Original) An apparatus for manufacturing a light guiding panel comprising:

a transfer apparatus which places a transparent substrate that is a raw material of the light guiding panel, on a transfer line and transfers the transparent substrate at a predetermined transfer speed; and

a particle injection apparatus which mixes minute particles with a high speed fluid flow, and injects the mixed particles on the surface of the transparent substrate being transferred, through at least one or more injection pipes, such that recesses are formed on the surface of the transparent substrate, wherein the injection amount of the minute particles is constant with respect to time, and the recesses are formed such that distribution density of the recesses gradually increases as a distance from a light incident surface increases.

23. (Original) The light guiding panel manufacturing apparatus of claim 22, further comprising: a control unit which automatically controls the entire operations of the transfer apparatus, including the transfer speed of the transparent substrate, according to conditions set by

a user.

24. (Original) The light guiding panel manufacturing apparatus of claim 23, further comprising: at least one sensor which is installed on a predetermined position of the transfer line of the transfer apparatus, and detects the passage of the transparent substrate and provide the information to the control unit.

25. (Original) The light guiding panel manufacturing apparatus of claim 23, further comprising: a chamber unit which is arranged on the transfer line of the transfer apparatus, provides a space defined by side walls and a top surface, includes the particle injection apparatus, has an open bottom part exposed to the transparent substrate, and is constructed so that minute particles collided with the transparent substrate fall downward without emitted to the outside; and a particle collecting unit which is arranged below the chamber unit and collects the falling minute particles on one place.

26. (Original) The light guiding panel manufacturing apparatus of claim 25, further comprising: a feedback unit which feeds minute particles collected in the particle collecting unit back to the container of the particle injection apparatus.

27. (Original) The light guiding panel manufacturing apparatus of claim 25, further comprising: a dust removing apparatus which connects to and provides a path to the chamber, inhales dust inside the chamber and filters the dust.

28. (Original) The light guiding panel manufacturing apparatus of claim 22, wherein the particle injection apparatus injects the minute particles through at least one injection nozzle, and the minute particles injected through the injection nozzle are diffused forming roughly a circle or an oval shape, and the injection nozzle is arranged so that the direction of the outlet of the injection nozzle is roughly perpendicular to the transfer direction of the transparent substrate and slanted to the surface of the transparent substrate at a predetermined angle, and a principle for forming recesses by diffusion of injected minute particles is used such that the density of

recesses decreases as the distance between a location on the surface of the transparent substrate and the outlet of the injection nozzle increases.

29. (Original) The light guiding panel manufacturing apparatus of claim 22, wherein the particle injection apparatus comprises a plurality of injection nozzles and the plurality of the injection nozzles are arranged in a row in the direction across the transfer direction, and as impacting areas by minute particles formed on the transparent substrate are partially overlapping, the impacting areas are connected in a row in the width direction of the transparent substrate, and the interval between injection nozzles and/or the injection amount of each injection nozzle are determined based on the distribution of recesses to be formed on the transparent substrate.

30. (Original) The light guiding panel manufacturing apparatus of claim 29, further comprising: a swinging unit which during an injection process swings the plurality of injection nozzles in the direction across the transfer direction of the transparent substrate such that the recess distribution by neighboring injection nozzles change smoothly.

31. (Original) The light guiding panel manufacturing apparatus of claim 30, wherein the swinging unit comprises: vertical position and horizontal position adjusting members which adjust the vertical position and horizontal position of each injection nozzle, respectively; a guide member which is connected to the horizontal position adjusting member and enables movement in the horizontal direction; and a servo motor unit which provides power to the guide member such that each injection nozzle swings in the horizontal direction.

32. (Original) The light guiding panel manufacturing apparatus of claim 22, wherein the particle injection apparatus comprises: a container which stores minute particles and discharges a predetermined amount of minute particles through a bottom outlet in a free-falling method; a connection member which is connected to a bottom outlet of the container and provides a falling path of the minute particles; a pressure fluid supply unit which supplies high speed compressed fluid through a pipe member; and at least one injection nozzle unit which is connected to the connection member such that the minute particles fall into an internal cavity,

and after the compressed fluid from the pipe member of the pressure fluid supply unit, the pipe member which is extended to the vicinity of the outlet of the cavity, are mixed with minute particles, injects the mixed fluid and particles to the outside through an outlet which is connected to the cavity,

wherein a vent hole through which fluid flows in the falling path is formed on a position of a predetermined height of the connection member and a low pressure atmosphere in the cavity and the connection member generated by high speed injection is complemented by fluid flowing in through the vent hole such that the minute particles are made to free-fall in an interval higher than the vent hole.

33. (Original) The light guiding panel manufacturing apparatus of claim 22, wherein the particle injection apparatus comprises: a container which stores minute particles and discharges a predetermined amount of minute particles through a bottom outlet in a free-falling method; a mixing transfer unit which mixes free-falling minute particles with high speed air and forcibly transfers the mixed particles through a transfer pipe; and an injection pipe which is a pipe having an entrance and an outlet that are all open, whose entrance is connected to the outlet of the mixing transfer unit, and whose internal section shape shows that the thickness decreases and the width increases in the direction to the outlet,

wherein the mixed air and minute particles flowing in through the transfer pipe are injected through the outlet of the injection pipe.

34. (Original) The light guiding panel manufacturing apparatus of claim 33, wherein the particle injection apparatus further comprises: a thickness adjusting unit which varies the thickness of a section of minute particle group injected through the outlet of the injection pipe, in the width direction.

35. (Currently Amended) The light guiding panel manufacturing apparatus of ~~any one of claims 33 and 34~~ claim 33, wherein a plurality of the particle injection apparatuses are arranged along the transfer line of the transparent substrate.

36. (Original) The light guiding panel manufacturing apparatus of claim 33, wherein the

mixing transfer unit is formed by connecting one or a plurality of blowers, each blower having a rotor arranged in the internal space which has an open entrance and an open outlet and has a roughly cubic shape, and a motor which is installed outside the cube and rotates the rotor at a high speed.

37. (Currently Amended) The light guiding panel manufacturing apparatus of ~~any one of claims 31 and 33~~ claim 31, wherein the particle injection apparatus further comprises: an opening and shutting control unit which controls whether or not to discharge the minute particles from the container.

38. (New) The light guiding panel manufacturing apparatus of claim 34, wherein a plurality of the particle injection apparatuses are arranged along the transfer line of the transparent substrate.

39. (New) The light guiding panel manufacturing apparatus of claim 33, wherein the particle injection apparatus further comprises: an opening and shutting control unit which controls whether or not to discharge the minute particles from the container.